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Original Articles.

A CONTRIBUTION TO THE STUDY OF SECONDARY DEGENERATION FOLLOWING CEREBRAL LESIONS.[1]

By WILLIAM G. SPILLER, M.D.,

Professor of Diseases of the Nervous System in the Philadelphia Polyclinic; Pathologist to the Pennsylvania Training School for Feeble-Minded Children.

From the Wistar Institute of Anatomy and Biology.

This case and the following, K. K., have been obtained from the Pennsylvania Training School for Feeble-Minded Children.

The history of the boy, W. M., as far as known, is as follows:

He was born January 28th, 1882, and began to walk when about a year and a-half old. When he was little more than two years old, he " was frightened by a cat and was paralyzed," so that he had no use of the right upper limb. About this time he was noticed to be weak-minded. It seems probable that the vascular lesion, which caused the right hemiplegia, developed at this age. The boy learned to walk after braces had been applied to the right lower limb, but later these became unnecessary and were removed. He never used a crutch. Epileptic attacks first appeared when the child was ten years old, and at the age of thirteen these became more severe, and walking became impossible. In the convulsions the muscles of the entire body, as well as those of the head, were contracted. The mother states that the attacks were announced by screams, and that these were followed by partial unconsciousness. The boy never attended school, and was mentally not more developed than a child at the age of three. He spoke very indistinctly, but could be understood by his relatives, and seemed to understand what was said to him. He was left-handed, and the right upper limb was contractured and imperfectly developed. The labor is said to have been very difficult.

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[1] One of two papers presented for membership in the American Neurological Association.

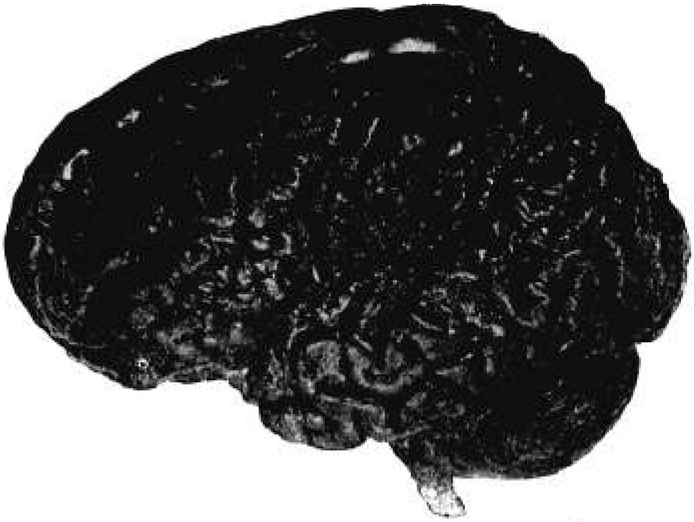

FIG. I.

The photograph represents very well the condition of the brain. The area nourished by the Sylvian artery was sclerotic. Only the cortex of the superior part of the central gyri was preserved, and yet the connection of this part with the internal capsule was destroyed. The foot of the third frontal gyrus was sclerotic, though to a less degree than the other parts of the Sylvian area. The first temporal and supramarginal gyri and the insula were entirely destroyed, and the angular convolution was also affected. The entire left hemisphere was notably smaller than the right. The area of Broca and the centres for word-hearing and word-seeing were in the sclerotic region. The prefrontal lobe, the upper part of the central and parietal and the occipital and temporal lobes, in large part, were intact. These unaffected portions do not receive their blood-supply from the Sylvian artery. The brain, with the pons and oblongata, was hardened and cut in about nine hundred serial sections. The terminology employed in this description is chiefly that used by Dejerine in his *Anatomie des Centres Nerveux*.

The large pyramidal cells (*Riesenzellen*) are absent in the upper part of the central gyri in sections taken from a portion which externally appeared normal, and indeed the smaller cells are not as numerous as in a normal brain, and are irregular and very imperfect.

Sections Nos. 875 to 860 through the upper part of the tail of the caudate nucleus show that the sclerosis involves the posterior limb of the internal capsule so completely that only a very few horizontal medullated fibres may be found within it. The inferior longitudinal fasciculus, the optic radiation, and the tapetum are interrupted by the primary lesion. A narrow band of fibres near the tail of the caudate nucleus, and a larger band more posteriorly on the lateral side of the ventricle are left. The tail of the caudate nucleus has not been destroyed, and contains many fine black points by Weigert's stain, representing bundles of fibres cut transversely. Within the posterior part of the head of the caudate nucleus (the anterior part is not in the sections) there are also many of these points. The anterior limb of the internal capsule at this high level shows a slight degeneration, though it is intact at lower levels. The sections contain the uppermost part of the thalamus, which is very small. It has been impossible to keep the sections from the two hemispheres in the same plane, as the left half of the brain was so contracted. The cortex consists of sclerotic tissue.

Sections Nos. 846 to 833:—The few fibres present in the posterior limb of the internal capsule have almost entirely a horizontal course, and pass into the external nucleus of the thalamus. The anterior limb of the internal capsule is nearly normal, though smaller than that of the right side. The fibres

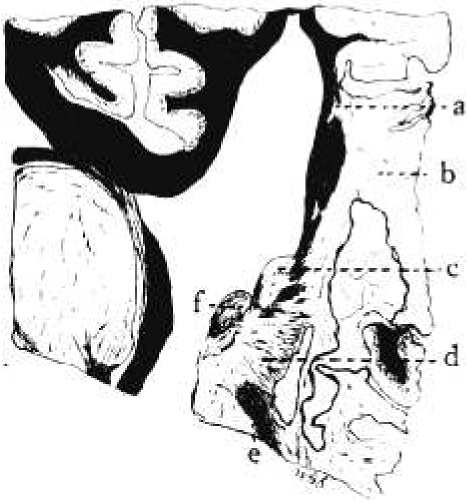

FIG. II.

Section 860. (a) Optic radiation and inferior longitudinal fasciculus; (b) degenerated cortex; (c) tail of the caudate nucleus; (d) posterior limb of the internal capsule; (e) anterior limb of the internal capsule; (f) thalamus.

present in the knee of the internal capsule have a horizontal course and seem to connect the anterior part of the putamen with the thalamus, though some, evidently, belong more directly to the anterior limb of the capsule. The extreme anterior end of the putamen is preserved, and contains a number of horizontal medullated fibres. All the middle and posterior part of the putamen is involved in the primary lesion. The posterior part of the head of the caudate nucleus (the only part in the sections) appears normal. The anterior nucleus of the thalamus is smaller than that of the right side, and contains fewer medullated fibres. The stratum zonale is preserved, as are also the laminæ medullares of the thalamus. The external nucleus of the thalamus is very small, but contains many medullated fibres. At this level the posterior part of the thalamus receives a certain number of fibres from the optic radiation. The tail of the caudate nucleus is intact. Only the anterior part of the external capsule is preserved. There are a few masses of gray matter belonging to the posterior part of the putamen. These give origin to numerous horizontal fibres which pass into the external nucleus of the thalamus; some, however, pass only part way through the sclerotic tissue of the posterior limb of the internal capsule.

Sections Nos. 827 to 816:—As the perpendicular fibres of the posterior limb of the internal capsule are destroyed, except a very few, it is important to notice the horizontal fibres which connect the lenticula with the external nucleus of the thalamus. The second segment of the lenticula is now visible and contains many medullated fibres. The horizontal fibres of the posterior limb of the internal capsule are somewhat more numerous in the posterior part of the limb. The inferior longitudinal fasciculus and the optic radiation contain more fibres than in sections from higher levels. The anterior nucleus of the thalamus has become much smaller. The internal nucleus is distinct, but is smaller than that of the right side. The tænia thalami is well preserved. The anterior limb of the internal capsule is intact, and some fibres in the knee of the capsule are preserved. The inferior longitudinal bundle, optic radiation and tapetum at some little distance from the tail of the caudate nucleus are much degenerated, but as there are many fibres in the retrolenticular segment of the internal capsule, they must represent fibres which ascend in their course forward. A large part of the putamen and external capsule are destroyed. The habenula is well formed.

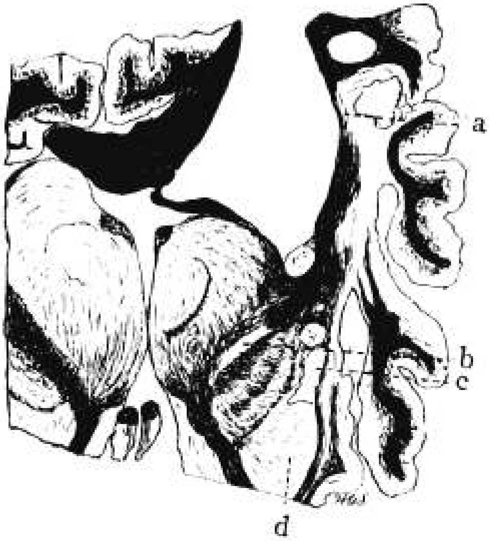

Fig. III.

Section 812. (a) Optic radiation and inferior longitudinal fasciculus; (b) posterior limb of the internal capsule (degenerated); (c) posterior part of the putamen destroyed by the primary lesion; (d) anterior part of the putamen (normal).

Sections Nos. 812 to 800:—Only the posterior part of the putamen is destroyed. The second segment of the lenticula is well formed, and contains many medullated fibres. The first segment also appears normal. The posterior limb of the internal capsule is much contracted. The internal nucleus of the thalamus is distinctly separated from the external by the lamina medullaris interna. The pulvinar begins to be prominent. The lamina medullaris externa and the zona reticulata are distinct. The laminæ of the lenticula are also well formed. The bundle of Vicq d'Azyr on the left side is a trifle smaller and less deeply stained. The anterior pillars of the fornix are the same on two sides. The tænia semicircularis is of good size and well stained. The fibres of the inferior longitudinal bundle, optic radiation and tapetum are only interrupted at one portion of their course. The zone of Wernicke is deeply stained and appears normal, as only the uppermost part of the optic radiation was cut. The fasciculus of Türck begins to appear. The external capsule now forms an unbroken band, but the fibres are not numerous. There are medullated perpendicular fibres present in the extreme anterior part of the posterior limb of the internal capsule.

Sections Nos. 799 to 792:—The posterior commissure is normal. The putamen is no longer destroyed in its posterior part. The pulvinar is not quite as large as that of the right side at higher levels, and probably this is the result of destruction of the superior fibres belonging to the optic radiation. Fibres may be noticed passing toward the anterior and outer part of the posterior limb of the internal capsule. These are coarser than the fibres which enter the thalamus directly. Some of these coarser fibres appear to pass through the anterior part of the posterior limb of the internal capsule into the thalamus, for though it is impossible to trace them in their passage through the capsule, there are fibres on the outer side of the bundle of Vicq d'Azyr which appear to be the continuation of these. Some of these fibres, however, seem to remain in the anterior part of the posterior limb of the internal capsule, and from this level medullated fibres may be traced in this part into the median bundle of the peduncle.

Sections 784 to 773:—The fasciculus retroflexus of Meynert, arising in the habenula, is well colored. The horizontal fibres connecting the thalamus with the lenticula are more numerous than in sections from higher levels. The fasciculus of Vicq d'Azyr is well stained, and is about the size of that on the right side. The thalamic fasciculus of Forel (*Markfeld H1*) is distinct, as is also the lenticular fasciculus of Forel (*Markfeld H2*). These do not appear to be atrophied, or if so, they are to a very slight degree. The median nucleus of Luys has nearly the normal size, but the semilunar nucleus of Flechsig, so called by Dejerine, (*Schalenförmigerkrper*) is very small. Fibres from the lamina medullaris interna of the lenticula begin now to pass through the internal capsule. The pulvinar is of good size, and the zone of Wernicke is intensely stained. The fasciculus of Türck is very distinct. The left anterior pillar of the fornix is fully as large as the right. The left ansa lenticularis at this level is smaller than the right, but this is chiefly the result of a difference in the level of the two sides. The zona incerta is small.

Sections Nos. 755 to 743:—The ansa lenticularis is a little smaller on the left side. The internal geniculate body appears in its most superficial part, and is much atrophied. The upper portion of the external geniculate body is also visible, and the peculiar divisions of this body are very distinct. The peduncle of the anterior quadrigeminal body is intact. The peduncle of the posterior does not contain the normal number of fibres. The median side of the capsule of the nucleus ruber, *i. e.*, the *Haubenstrahlung* in the sense of v. Monakow,—contains fibres from the ansa lenticularis (Dejerine), and no difference in the size of this median portion in the two hemispheres is observable. The left nucleus ruber is much smaller than the right, but the level on the two sides is not the same. The anterior com-

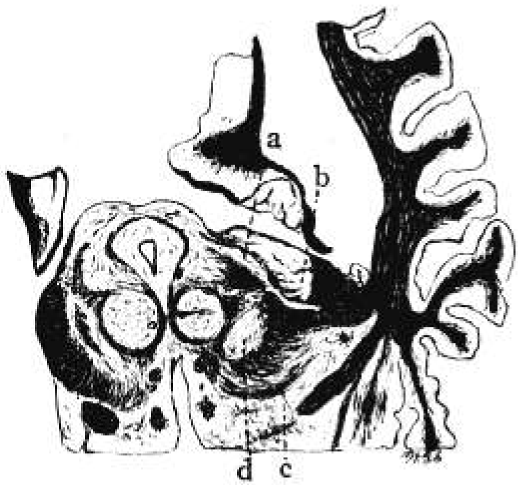

FIG. IV.

Section 736. (a) Internal geniculate body (partly atrophied); (b) external geniculate body; (c) ansa lenticularis; (d) corpus subthalamicum.

missure is small. The posterior longitudinal bundles are the same on the two sides. The left corpus subthalamicum may be a little smaller than the right in its greatest development, but there is no great difference between the two. In Mahaim's[*] case this body was much degenerated, but the destruction of the putamen seems to have been greater.

Sections Nos. 736 to 724:—The peduncle of the posterior corpus quadrigeminum contains quite a number of fibres at this level, though not as many as the corresponding bundle on the right side at higher levels. The ansa lenticularis is well formed at this level and cannot be regarded as degenerated to any noteworthy degree. The anterior part of the posterior limb of the internal capsule in all these sections contains medullated fibres. The commissure of Meynert is normal, and fibres of this band may be seen entering the posterior part of the internal capsule. These fibres are of fine calibre.

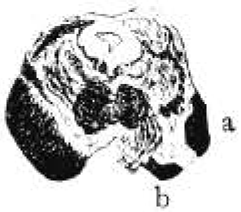

FIG. V.

Section 676. (a) Lateral bundle of the peduncle; (b) internal bundle of the peduncle.

Sections 714 to 661:—The left nucleus ruber is about equal in size to the right, though the latter in its greatest development is larger. The peduncle of the lateral mammillary body is normal, as is also the tubercle itself. Many horizontal fibres may be seen passing from the substantia nigra into the crusta, which is not as yet detached from the rest of the brain. The area which in higher levels is much degenerated, and which corresponds to the portion occupied by the motor fibres, contains many horizontal fibres. The commissure of Forel and the optic nerve are normal. The two mammillary bodies are about the same in size. The substantia nigra of the left side apparently contains as many cells and fine fibres as that in the right peduncle, but as the left crus is much smaller than the right the total number of cells in the substantia nigra is probably also less. The median portion of the crusta is well colored, as is also the lateral, which is about one-fifth of the width of the normal crusta. This lateral bundle contains no visible degenerated fibres. The fibres passing from the nucleus ruber to form the anterior cerebellar peduncle of the right side are apparently as numerous as on the left side. The lateral lemniscus is normal, and may be seen passing toward the nucleus of the posterior corpus quadrigeminum. This nucleus is of good size.

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[*] Mahaim: Archiv für Psychiatrie, vol. xxv.

Below section 661 it is not worth while to give the numbers, as the changes are not sufficiently numerous to justify such a procedure. There is no apparent difference in the number of the fibres constituting the middle cerebellar peduncles, but the left half of the pons is much narrower than the right. The right anterior cerebellar peduncle is a little smaller than the left. There are only a few perpendicular medullated fibres enclosed by the left middle cerebellar peduncle. The nuclei of the pontine gray matter seem to be equally numerous on the two sides, but there are probably not as many of these on the left side *in toto*. The left median lemniscus is smaller than the right. There are many cells in both sensory and motor nuclei of the fifth nerve on each side, and the spinal roots of the two fifth nerves seem to be of equal size. The nuclei of the sixth nerves are normal. The cells of the formatio reticularis appear equally numerous on the two sides. The ventral acoustic nuclei and the acoustic tubercles are well formed on both sides. The left interolivary layer is one-third smaller than the right, and the fibres appear to be of smaller calibre, and yet this is a point most difficult to decide, although the method of coloration by the carmine *en masse* has been employed, and the result is excellent. The left pyramid is entirely degenerated. The right pyramid does not appear extraordinarily large, although it is of full size. The nuclei of Burdach and Goll are smaller on the right side, and contain fewer cells. At the motor decussation there are fibres which appear to penetrate the gray matter to enter the lateral column on the side of the normal pyramid. The cranial nerves and nuclei all appear to be normal.

A history of a fright, which was supposed to have been the cause of the paralysis, is given in this case. It is difficult to picture any morbid process which could be produced in this way. A much more probable explanation is that the fright occurred simultaneously with the occlusion of the Sylvian artery. In attempting to remove this artery from the hardened brain it broke near the sclerotic area. Nothing pathological could be observed in the piece thus obtained. The cortical branches of the artery could not be distinguished from the sclerotic tissue. It is impossible to state whether the occlusion was the result of a thrombus or embolus. Most physicians would probably think of the latter cause, though Gowers[3] believes that thrombosis *in situ* is more common in such cases as this. Taylor,[4] however, reports a case in which embolism of the left middle cerebral artery was found in a child of five. The feeble intellect of W. M. was probably the result of this sclerosis, although the prefrontal lobe was well developed. The intellect may thus be of low grade when the greater part of the prefrontal lobe is intact, but considerable destruction of cortical tissue in some cases has not made the patient feeble-minded (v. Monakow's[5] case, No. 3). There may be a difference in this respect in proportion to the devlopment of the brain at the time the lesion occurs. Probably a congenital lesion in some cases may not produce the same symptoms as one which occurs when the child is two or three years old; and, therefore, at an age when the brain has attained a higher degree of development, and the nerve cells are less likely to assume abnormal functions.

The motor fibres of the left cerebral hemisphere were totally destroyed, and yet this boy was able to walk without a crutch, although in an imperfect manner. He had no use of the right upper limb. The conviction is forced upon us that the motor impulses to the right lower limb were transmitted through the pyramidal fibres from the right cerebral hemisphere. This preservation of bilateral motion with the absence of one pyramid is well shown in another case from the Elwyn institution. The pyramid on the same side as the normal hemisphere in this case is unusually large, and there is entire absence of the left pyramid. The case is one of porencephaly of the left lower

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[3] Gowers: Diseases of the Nervous System, vol. ii., English edition, p. 461.

[4] Taylor: British Medical Journal, 1880, vol. ii.

[5] V. Monakow: Archiv für Psychiatrie, vol. xxvii.

Rolandic region, and a picture of this brain was given in the January, 1897, number of the JOURNAL OF NERVOUS AND MENTAL DISEASE. This boy also was able to walk everywhere, although he limped, and the only motor fibres present were from the right pyramid. In the case of W. M., the right pyramid is not as large as in the case of porencephaly. It is probable that in the first case the lesion was post-natal, and in the second ante-natal, which accounts for the better compensatory development of fibres in the second case. A case in which the innervation of both sides of the body was probably from one cerebral hemisphere, has been reported by v. Monakow,[6] and the same explanation as above has been given. In Mahaim's[7] case, the lesion was in the Sylvian region, and involved the supramarginal, the first temporal gyrus, the insula, the claustrum, almost all the putamen, the head of the caudate nucleus, and the fibres from the central gyri. The hemiplegia developed at the age of nine months. Although the fibres from the right motor cortex were destroyed, the gait of the patient was not strikingly abnormal, and spastic phenomena were not present in the left lower limb. The left upper limb was contractured, but still of service. Mahaim says this case is an evidence of the connection of each pyramid with both sides of the cord, and this bilateral innervation is more perfect for the lower limbs than for the upper. Dejerine and Thomas[8] have reported a case similar to these. In one of v. Monakow's cases of infantile cerebral paralysis contracture of the upper limb, with shortening and diminution in the circumference of the forearm, was noticed, and yet the pyramid containing the fibres for this side of the body was only moderately degenerated. The hemiplegia developed at the early age of six months, and, therefore, at a period when compensation as a rule is more perfect. V. Monakow says this case shows that a partial interruption of the motor fibres may cause a considerable hemiatrophy with contracture. On the other hand, occasionally in cases of total pyramidal degeneration, the hemiatrophy and contracture may be less, as in Mahaim's case, and consequently the hemiatrophy is not directly proportional to the pyramidal degeneration, but is dependent on other unknown factors. Zacher[9] also has reported a case of partial degeneration of the pyramidal tract without evidences of paralysis during life. It is a curious coincidence that the epileptic attacks developed in the boy, W. M., at the same age as in the patient reported by v. Monakow as Case 3. In both cases the convulsions began at the age of ten and were general. This is additional proof that both sides of the body were innervated from one hemisphere. It is well known that extirpation of motor centres usually causes a cessation of epileptic movements in the corresponding limb. It seems probable that these bilateral convulsions were made possible by the formation of a lesion at an early age. The nervous system can adapt itself much better to altered circumstances if destruction of tissue occurs before the nerve cells and fibres are fully formed, and it would seem that even additional fibres may develop (cases of Mahaim, v. Monakow, Dejerine and Thomas, Adolf Meyer[10] and Spiller.

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[6] V. Monakow: Archiv für Psychiatrie, vol. xxvii, p. 408.

[7] Mahaim: Archiv für Psychiatrie, vol. xxv.

[8] Dejerine and Thomas: Archives de Physiologie, 1896.

W. M. spoke very indistinctly, but he was able to make himself understood, and appeared to understand any simple remark made to him. This is very interesting as the fibres from Broca's region were certainly very much damaged, and Freud's speech zone was sclerosed. Such a lesion in the adult causes both motor and sensory aphasia. V. Monakow reports a similar condition in his Case 2, and other cases are known in the literature.

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[9] Zacher: Archiv für Psychiatrie, vol. xxvii.; see also vol. xix.

[10] Meyer: Pathological Report of the Illinois Eastern Hospital for the Insane.

Many years ago v. Monakow showed that the internal geniculate body degenerates after lesions of the temporal lobe. According to Zacher,[11] Wernicke claimed that there is direct connection between this nucleus and the first temporal gyrus and the insula, and Zacher, from a study of his cases, is inclined to accept this statement, although he thinks the second temporal gyrus is probably also connected with this nucleus. This connection with the temporal lobe has been also observed by others. In v. Monakow's paper, to which reference must repeatedly be made, the internal geniculate body in Case 2 was degenerated from a lesion in the first temporal gyrus, the operculum, the insula, the third frontal convolution, and the putamen. This body was also smaller on the side of the lesion in Case 3. In my case this body is much atrophied, though not entirely absent, and destruction of the cortex of the hemisphere is extensive. The first temporal gyrus is entirely destroyed, and it is with this that the internal geniculate body is chiefly connected (v. Monakow). There is also decrease in the size of the peduncle of the posterior corpus quadrigeminum, as was seen also in v. Monakow's Cases 2 and 3. The nucleus of this quadrate body in the case W. M. is of good size. After extensive lesions of the operculum and temporal lobe the atrophy of the peduncle of the posterior corpus quadrigeminum is only of moderate intensity (v. Monakow). This is because the cortical neuron begins in the internal geniculate body. The case of W. M. confirms this statement.

Mahaim and v. Monakow in his Case 2 report degeneration of the ansa lenticularis, but the destruction of the putamen in both these cases was evidently greater than in my case. The ansa lenticularis on the left side of the brain of W. M. is very nearly as well developed as on the right, and this is probably to be attributed to the fact that the destruction of the lenticula was limited to the posterior and superior part of the putamen, and did not extend very far downward. In Mahaim's case the ansa lenticularis was not as much degenerated as in v. Monakow's, as the latter states. The lenticular fasciculus of Forel, and the lenticular laminæ in v. Monakow's Case 2 contained fewer fibres. These parts are quite well formed in the case W. M., and the median portion of the tegmental radiation (*Haubenstrahlung*) on the left side contains as many fibres as on the right. According to Dejerine the ansa lenticularis contributes fibres to the tegmental radiation. In the sense of v. Monakow (l. c., p. 113), the tegmental radiation includes all the fibres immediately surrounding the nucleus ruber. It seems probable that the ansa lenticularis arises chiefly from the lower part of the lenticula.

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[11] Zacher: Archiv für Psychiatrie, vol. xxii.

Zacher, Mahaim, and v. Monakow report degeneration of the nucleus ruber on the side of the primary lesion. In the case W. M. the left nucleus ruber is a little smaller than the right, but contains proportionally as many medullated fibres. The substantia nigra has been reported as atrophied in several cases of cerebral lesions. In the case W. M. this is not very evident. The substantia nigra is smaller, as the whole cerebral peduncle is smaller, but proportionally speaking it seems to contain a normal number of cells and fibres. According to v. Monakow this part is probably connected with the third frontal gyrus and anterior part of the insula and operculum. Edinger[12] states that fibres of the stratum intermedium come from the lenticula. V. Bechterew[13] says that the cells of the substantia nigra do not degenerate after lesions of the cortex and internal capsule. This substance was degenerated in Witkowski's[14] case and the lesion involved the lenticula with other parts of the brain.

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[12] Edinger: Vorlesungen über den Bau der nervösen Centralorgane. Fifth edition, pp. 288, 257.

[13] V. Bechterew: Archiv für Psychiatrie, vol. xix.

[14] Witkowski: Archiv für Psychiatrie, vol. xiv.

In Case 2 of v. Monakow's paper the cerebral peduncle was intensely degenerated on the median and lateral borders. These are intact in the case of W. M. Dejerine[15] believes that the median bundle of the peduncle comes from the Rolandic operculum and adjacent part of the frontal operculum. Zacher (l. c.) believes this portion of the crusta is chiefly connected with the insula. Flechsig and Wernicke think this bundle comes from the frontal lobe (quoted by v. Monakow). V. Monakow is in favor of the latter view after a study of his Case 2. In the case W. M. the most internal portion of the inner bundle of the crusta is well stained and may be traced from quite high levels of the internal capsule in the anterior part of the posterior limb. The operculum is degenerated. This seems to indicate that the origin of a portion of this bundle is anterior to the Rolandic operculum. In Mahaim's case (l. c.) this median bundle was degenerated, but the head of the caudate nucleus was destroyed by the primary lesion, and it is probable that the anterior limb of the internal capsule was also affected.

The degeneration of the lateral bundle of the crusta in v. Monakow's Case 2 is noteworthy, as the second and third temporal gyri were not degenerated. It may be that the fasciculus of Türck was cut internally to the cortex of the temporal lobe in its passage to the posterior part of the posterior limb of the internal capsule. In Mahaim's case (l. c.) the external fourth of the cerebral peduncle contained normal fibres, and the first temporal gyrus was involved in the primary lesion. V. Bechterew[16] in 1888 reached the conclusion that the lateral bundle of the cerebral peduncle arises in the temporal and basal part of the occipital lobe. Zacher (l. c.) also places the origin of these fibres in the occipital and temporal lobes. Dejerine (l. c.) has shown that the origin of this bundle is in the temporal lobe alone, and chiefly from the second and third convolutions. Kam[17] also believes that these fibres come only from the temporal lobe. Mills and Spiller[18] have shown that probably none of these fibres arise in the first temporal gyrus. This case, W. M., strengthens this latter view. The first temporal gyrus was entirely destroyed at an early age, and secondary degeneration elsewhere is distinct, and yet no indication of degeneration is found in the lateral bundle of the peduncle.

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[15] Dejerine: Anatomie des Centres Nerveux, vol. i, p. 602.

[16] V. Bechterew: Archiv für Psychiatrie, vol. xix.

The anterior and internal nuclei of the thalamus in Case 3 of v. Monakow's paper were almost of normal size. The central gyri with the operculum, the anterior part of the supramarginal gyrus, and the first temporal were destroyed by porencephaly. Only the frontal lobe and portions of the temporal lobe remained in connection with the internal capsule. This case in many respects is similar to mine. The left anterior nucleus in my case is only a little smaller than the right, and the internal nucleus is not nearly as much altered as the external (lateral). The lateral nucleus is greatly degenerated, as it was also in v. Monakow's Cases 2 and 3, in which also the ventral nuclei, as he calls them, and the posterior nucleus were degenerated. In Mahaim's case the anterior tubercle was the only thalamic nucleus intact, though the pulvinar was only a little smaller. From eleven human brains and from a number of brains of lower animals, in which experimental lesions were produced, v. Monakow concludes that every portion of the thalamus is in connection with some part of the cerebral cortex. Other cases in the literature support his views. This is contrary to the opinion held by Flechsig as regards his association centres. According to v. Monakow, a thalamic nucleus may not degenerate if some of the fibres passing to it are intact. Fibres from the first and second parietal gyri are in connection with the frontal and median portions of the pulvinar (v. Monakow). This probably explains the slight diminution in the size of the left pulvinar, as compared with the right, in the case of W. M. The ventral nuclei of the thalamus are supposed to be chiefly connected with the operculum, the central and the supramarginal gyri. The semilunar nucleus of Flechsig (Dejerine) is identical with v. Monakow's vent. b. nucleus. The ventral nuclei are the groups of cells situated in the ventral portion of the thalamus. In the case W. M. these cortical areas are degenerated, and the area occupied by the ventral nuclei is small. The internal nucleus probably receives its fibres from the second and third frontal gyri and the anterior part of the insula. This explains the moderate degeneration in the case of W. M. By lateral nucleus v. Monakow means only the dorsal part of the external nucleus. It is probable that this nucleus derives its fibres from the central gyri (operculum), the superior parietal, the anterior part of the supramarginal, the angular, the posterior part of the frontal gyri, and the temporal lobe. We have thus a satisfactory explanation for the great degeneration of the lateral nucleus in the case of W. M. It is certain, says v. Monakow, that fibres to the lateral nucleus come chiefly from the central gyri. The anterior tubercle of the thalamus probably receives fibres from the median portion of the first frontal, the paracentral lobe and gyrus fornicatus. All these parts were outside the sclerotic area, and yet as some of the projection fibres were doubtless cut, we have an explanation for the slight degeneration of the anterior tubercle in the case of W. M.

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[17] Kam: Archiv für Psychiatrie, vol. xxvii.

[18] Mills and Spiller: Journal of Nervous and Mental Disease, 1896.

The preservation of the external geniculate body, of the peduncle of the anterior quadrigeminal body, and of this body itself, are explained by the normal condition of the optic cortex and the preservation of the optic radiation, except in its most superior part.

The corpus mammillare receives fibres from the uncus, cornu ammonis and surrounding tissue, through the fornix. None of these parts were degenerated in the case of W. M. In another case, which has only been examined macroscopically, and which I hope to be able to report later, more in detail, the occipital lobe is destroyed and the cornu ammonis is, to all appearances, much affected by the primary lesion. The corpus mammillare on the same side is only half as large as the corresponding body on the normal side of the brain.

The corpus subthalamicum is not closely connected with the cerbral cortex, but it is with the caudate nucleus and anterior part of the putamen (v. Monakow). Only the posterior and superior part of the putamen was destroyed in the case of W. M. The normal appearance, or at least very slight diminution in the size of the subthalamic body, may be easily explained.

The fibres of the nucleus ruber have been found atrophied after lesions of the cortex of the operculum, the second parietal gyrus and possibly the temporal lobe (v. Monakow). This nucleus is not much smaller on the left side than on the right in the case W. M.

The sensory nucleus of the fifth nerve on the side opposite to the cerebral lesion is not degenerated; the case therefore supports the statements of Mahaim (l. c.), but is contrary to those of Hösel.[19] The latter asserts that the sensory nucleus of the fifth nerve is in direct connection with the central gyri of the opposite side. It is well known that Hösel found the contralateral sensory nucleus of the fifth nerve atrophied, after a lesion of the central gyri. The right anterior cerebellar peduncle is a little smaller than the left. Unfortunately, a portion of the tissue was lost just at this part by the sections which were made for the purpose of hardening. Hösel (l. c.) found the anterior cerebellar peduncle on the side opposite the lesion one-third less in size, and he believed his case showed that there is a connection of this with the central lobe. Edinger believes the connection is indirectly with the parietal lobe. According to Hösel, Meynert also thought that there is a connection of the nucleus ruber with the parietal lobe. V. Monakow also reports atrophy of the contralateral anterior cerebellar peduncle.

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[19] Hösel: Archiv für Psychiatrie, vol. xxiv., xxv.

In sections taken from the extreme upper part of the ascending frontal convolution which externally appeared to be normal, as may be seen in the picture, search was made for the giant pyramidal cells (Betz). These cannot be found. Mahaim states that Moeli and Henschen as well as he himself have noted the absence of these cells in cerebral lesions in man.

LA MORT DANS L'HYSTERIE (Death in Hysteria). (Journ. de Méd. et Chir. prat., Aug. 25th, '96.)

Although the manifestations of hysteria are usually considered to be of a benignant character, cases have been observed in which death, due to various conditions, has occurred suddenly. Dr. Le Fournier, in a thesis, has collected a number of illustrative cases, and points to the dangers connected with spasm of the glottis, and anorexia. Thus several cases are reported in which tracheotomy was resorted to, in order to prevent asphyxia. A child, six years old, in imminent danger of being asphyxiated, the attack lasting one hour, was saved by applying the faradic current. Another case was that of a girl, 20 years old, subject to laryngeal spasms, who was revived by artificial respiration, but who died shortly afterwards in a similar attack. Hysterical anorexia ends fatally quite often. After a certain duration the patients fall into a semi-comatose condition, become sleepless, greatly emaciated, and bedridden. If fed artificially in this state the patients continue to lose flesh, the stomach being unable to perform its functions. Death may also occur from incessant vomiting, as for instance: A patient, who was subject to attacks of hysterical vomiting, after taking her evening meal as usual, went to bed and died during the night. The autopsy, made thirty-six hours after death, revealed nothing abnormal of note, and the stomach contained four ounces of food. Occurrence of sudden death in hysterical subjects has further been observed to be due to attacks of angina pectoris, and supervening upon abdominal operations, especial vaginal hysterectomy. MACALESTER.